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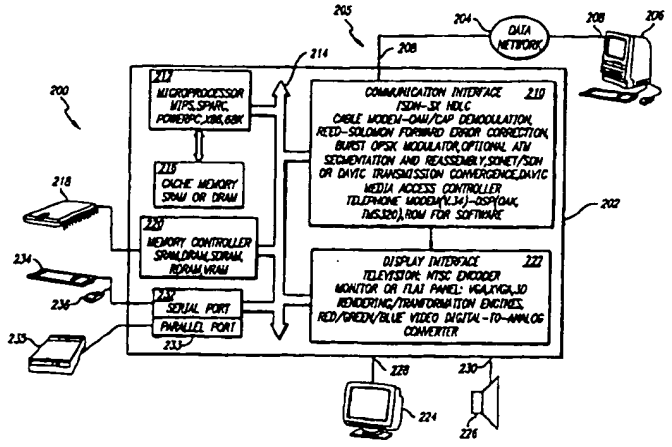

(57) Abstract

An integrated network browser controller chip (218), network device (202), and network system (204) is disclosed for data transmission and reception over a network. The network browser chip includes a microprocessor (212) for operating a network browser program to connect the network browser chip to the Internet, an on-chip memory for storing the network browser (216) and the operating system program, a communications interface (210) for connecting the network browser chip to the Internet, and a user interface (234) for transferring user instructions to the network browser chip and for transferring data from the network to the user. A network browser device is further disclosed which utilizes a single integrated network browser controller chip (218) for connecting the device to the network (204). A non-networking electronic device is further disclosed which is modified with the integrated network browser controller chip (212) to enable data transmission and reception over the network.

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Integrated Network Browser Chip, Network Browser System, and Method for Network Data Communication

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to integrated circuit chips, network devices and systems, and more particularly to a single integrated browser controller chip, a network browser device, a network browser system and method for digital data communication over a network, such as the Internet.

2. Description of the Related Art

Certain known conventional integrated circuits, network systems and methods are utilized to communicate data between personal computers (PCs) through public switched telephone networks (PSTNs). Networks, such as the Internet or World Wide Web, provide a conduit for data to pass between various users, while PCs with modems utilizing integrated circuits and network software provide the interface to receive and transmit data across the network.

A typical implementation of a network system is shown in Figure 1 in which PCs 100, 102 are shown with a standard modem card and utilize conventional integrated circuits and network software to connect through network 104, such as the Internet or World Wide Web network. Although this implementation is satisfactory for general purpose PC communication across network 104, such communication does not utilize nor require many of the computer resources of a general purpose PC, such as a math coprocessor and compiler. Thus, there is a need for more integrated network communication chips and devices utilizing integrated network communication chips operable within network browsing systems.

SUMMARY OF THE INVENTION

In accordance with the present invention, a network browser controller chip for data transmission and reception over a network integrates network communication and browser technology on a single chip. The single, integrated, network browser controller chip of the present invention implements logic and memory circuits for conventionally connecting to the Internet network. The integrated network browser chip includes a communications interface for connecting to a network, such as the Internet, a microprocessor for operating a network program to log onto and browse the Internet network, a memory for storing the network program, and a user interface for transferring user instructions to the network browser chip and for transferring data from the network to the user.

Alternative embodiments of the present invention include the implementation of the network browser chip with on-chip decompression circuitry for operating on data received in compressed form, on-chip memory circuitry for storing system and network software, and peripheral bus controller interface circuitry for controlling the flow of data and instructions between the network browse device and external devices.

In accordance with the present invention, a network browser device utilizes the network browser chip for conventionally connecting to the Internet network.

Alternative embodiments of the present invention include the implementation of the network browser chip within conventional non-network, human interface electronic devices to enable conventional connecting to the Internet network.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of a conventional PC to PC communication system via the Internet network.

Figure 2A is a block diagram of a network browser device with a single integrated network chip to PC communication system via the Internet network according to the present invention.

Figure 2B is a block diagram of an alternative embodiment of the single integrated network chip including a decompression circuit according to the present invention.

Figure 2C is a block diagram of an alternative embodiment of the single integrated network chip including an on-chip memory circuit according to the present invention.

Figure 2D is a block diagram of an alternative embodiment of the single integrated network chip including a bus controller interface according to the present invention.

Figure 3A is a block diagram of a network browser system utilizing the integrated network browser controller chip according to the present invention.

Figure 3B is a block diagram of an alternative embodiment of the network browser system utilizing the single integrated network browser controller chip including on-chip boot memory circuitry according to the present invention.

Figure 3C is a block diagram of an alternative embodiment of the network browser system utilizing the single integrated network browser controller chip including decompression circuitry according to the present invention.

Figure 3D is a block diagram of an alternative embodiment of the network browser system utilizing the single integrated network browser controller chip including a peripheral bus controller interface according to the present invention.

Figure 4A is a block diagram of a television system utilizing the single integrated network browser controller chip according to the present invention.

Figure 4B is a block diagram of an alternative embodiment of a television system utilizing the single integrated network browser controller chip according to the present invention.

Figure 4C is a block diagram of a telephone system utilizing the single integrated network browser controller chip according to the present invention.

Figure 4D is a block diagram of a cellular telephone system utilizing the single integrated network browser controller chip according to the present invention.

Figure 5 is a flowchart of a user session utilizing a network device with a single integrated network browser controller chip according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figure 2A, there is shown a network browser device 200 including a single, integrated network controller chip 202, according to the present invention, for transmitting and receiving data across a data network 204, such as the Internet and World Wide Web, where chip is defined as an integrated circuit on a single substrate or a multi-chip module (MCM) on an integrated rigid structure. According to the present invention, a network system 205 connects network browser device 200 to multiple data bases, workstations and/or personal computers (PCs) 206 through data network 204. It may be appreciated that PC 206 may be a PC or another network browser device capable of receiving and/or transmitting information across data network 204.

Network browser device 200 connects to data network 204 through serial port 208, such as a conventional RS232 port. Network browser chip 202 is implemented with semiconductor material, such as silicon or gallium arsenide, using complimentary metal oxide semiconductor (CMOS) technology, housed in a conventional pin package, such as a 208 pin quad package, and, is installed

within network browser device 200 on a conventional motherboard which connects to serial port 208.

Network controller chip 202 includes a communication interface 210 which connects conventional communication circuitry operating conventional communication software to digital processor circuitry 212 operating conventional network software through internal system bus 214.

Communication interface 210 connects to serial port 208, which in turn, connects with conventional communication equipment, such as a telephone or ISDN line, or cable linked to a communication server, and provides an access route for network browser device 200 to network 204. Network browser device 200 thereby communicates bi-directionally with other machines connected to network 204, such as a PC with a modem card and network software, a computer database, or another network browser device.

Communication interface 210 may use conventional Electronic Industry Association/Telecommunication Industry Association (EIA/TIA) Class 2 compatible data communication circuitry (DCE) for connecting to network 204 through coaxial or twisted pair wiring. The communication interface 210 may utilize conventional protocols, such as ISDN, phone modem, ATM or Ethernet.

Communication interface 210 may include an ISDN interface to connect with primary or basic rate interfaces. The ISDN interface uses serial communications blocks, such as HDLC controllers, with an optional analog physical medium device.

Communication interface 210 may include a telephone modem interface to connect network browser device 200 to network 204 through conventional phone lines. The telephone modem interface includes conventional V.32 or V.34 modem circuitry having digital signal processor (DSP) circuitry, such as TMS320 series DSP circuitry manufactured by Texas Instruments Corporation or Oak DSP circuitry manufactured by LSI Logic Corporation, and Read-Only-Memory (ROM) circuitry, operating on conventional modem software stored by the ROM.

Communication interface 210 may additionally or alternatively include a cable modem interface. The cable modem circuitry includes conventional quadrature amplitude modulation (QAM) or carrier amplitude phase (CAP)

demodulation circuitry for downstream communication, and Reed-Solomon forward error correction circuitry, burst QPSK modulator circuitry, or phone modem circuitry for back channel communication. The cable modem interface may additionally include an asynchronous transfer mode (ATM) segmentation and reassembly (SAR) termination circuitry with either a dedicated hardware SAR or software running on digital processor 212, such as the ATMizer® architecture designed and manufactured by LSI Logic.

Communication interface 210 may additionally include synchronous optical network/synchronous digital hierarchy (Sonet/SDH) or digital audio visual interest conunittee (DAVIC) transmission convergence circuitry, such as manufactured by LSI Logic, for cable modem or other broad band communication mediums; DAVIC media access controller (MAC) circuitry, such as manufactured by LSI Logic, for cable modem or other broad band communication mediums; Viterbi decode circuitry, such as manufactured by LSI Logic, for decoding data streams; and, VSAT cellular circuitry,such as manufactured by LSI Logic, utilizing a general systems mobile (GSM), code division multiple access (CDMA) e.g. IS-95, or, time DMA or American National Standards Institute (ANSI) e.g. IS-54 or IS-136 standard implementation for wireless communication.

As an example embodiment, communication interface 210 QAM/CAP demodulation circuitry may receive data from network 204 while communication interface 210 burst QPSK modulator circuitry simultaneously sends data and/or instructions onto network 204.

In another embodiment, an off-chip conventional radio frequency (RF) transceiver connects through an analog-to-digital (A/D) and digital-to-analog converter to communication interface 210 which decodes radio transmissions from a network 204 source, such as a satellite, through a QPSK demodulator and Viterbi decoder or decodes radio transmissions from a network 204 source, such as a cellular transceiver, through a VSAT cellular decoder.

Digital processor circuitry 212, shown in Figure 2A, controls the browser operation and comprises conventional microprocessor circuitry, such as a 486 microprocessor manufactured by Intel, a MIPS microprocessor manufactured by MIPS or IDT, a SPARC microprocessor manufactured by Sun Microsystems, a

PowerPC microprocessor manufactured by Motorola or IBM, or a 68000 series microprocessor manufactured by Motorola. Digital processor circuitry 212 operates conventional system software, such as Java manufactured by Sun Microsystems or commercially available compact operating system software manufactured for UNIX- or Apple-based systems, and operates conventional network software, such as NetCruiser manufactured by Netcom, NetScape manufactured by Netscape, or network software manufactured by Microsoft.

Digital processor circuitry 212 controls the network communication by receiving a timing signal from an oscillator (not shown), and sending and receiving control instructions to and from cache memory circuitry 216, such as a conventional eight kilo-byte (8K) static random access memory (SRAM) or dynamic RAM (DRAM), or off-chip memory 218, such as a conventional four mega-byte SRAM, DRAM, synchronous DRAM (SDRAM), Rambus DRAM (RDRAM), or virtual RAM (VRAM) connected to processor circuitry 212 through conventional memory controller circuitry 220 and bus 214.

In the preferred embodiment a network server, such as Netcom, Netscape or Microsoft, provides a source of software applications which may be swapped in and out of on-chip or off-chip memory, such as memory 216 or 218, during network operation of network chip 202, thus reducing the amount of memory required for network operation. Basic software, such as operating system, browser, and that software needed for real-time operations, are preferably stored by on-chip memory, such as memory 216, or off-chip memory, such as memory 218. Processor 212 sets up automatic synchronous word, baud rate detection, and network information exchange for all standard network protocols which preferably are embedded or stored in cache memory 216.

Network chip 202, shown in Figure 2A, includes display/audio interface circuitry 222, such as conventional monitor or flat panel VGA, XVGA or similar display and video/audio digital-to-analog converter circuitry, connecting external display and audio devices, such as a conventional monitor or flat panel 224 and speaker 226, through conventional display and audio ports 228, 230. Data received from data network 204 may thereby be received and converted to readable input format through communication interface 210, passed through bus

214 to display/audio interface 222, converted to display or audio compatible format by display/audio interface 222, and displayed on monitor 224 and/or reproduced with sound by speaker 226.

For monitors, display/audio interface 222, shown in Figure 2A, includes a graphics interface. The graphics interface includes bitblit interface circuitry for X-terminal display, VGA or XVGA interface circuitry for two dimensional graphics, or three dimensional graphics interface circuitry which has rendering interface circuitry and graphics transformation circuitry.

For interfacing with PCs, the display/audio interface 222 includes red, green, and blue video DAC circuitry.

Display/audio interface circuitry 222 may alternatively or additionally include conventional television NTSC (U.S. standard) or PAL (European standard) encoder/decoder circuitry connectable to a conventional television usable asa display device 224 and three-dimensional (3D) rendering/transformation engine circuitry.

Network chip 202 includes conventional serial port interface 232, shown in Figure 2A, connecting user input devices, such as conventional keyboard 234 and mouse 236,and includes conventional parallel port 233, shown in Figure 2A, connecting to a peripheral device, such as printer 235.

Alternatively or additionally, serial port interface circuitry 232 may include audio/video analog-to-digital converter and interpreting circuitry connecting to conventional microphone or camera devices (not shown) usable as input devices. In an alternative embodiment, infrared, optical, or sonic transceiver devices may be symbiotically utilized for communicating between the user and browser device 200, where serial port interface circuitry 232 includes conventional infrared, optical, or sonic circuitry. It may further be appreciated that it may be more efficient to combine serial port circuitry 232 and display/audio interface circuitry 222.

Network browser device 200 includes a conventional power supply (not shown) which connects to a standard wall plug outlet providing standard U.S. alternating current or European direct current voltage supply. Alternatively and/or

additionally, network browser device 200 includes a conventional battery supply (not shown) which powers the internal browser device 200 circuitry.

Referring to Figure 2B, an alternative embodiment of network chip 202 includes decompression interface 238 which receives data from bus 214 containing compressed picture,video, and/or voice information, decompresses the compressed information, and transfers the decompressed picture, video, and/or voice data to display interface circuitry 222 through bus 214. In alternate or composite embodiments, decompression interface 238 includes a joint picture expert group (JPEG) decompressor, such as the L64702 decompressor manufactured by LSI Logic, to decompress information compressed using the JPEG standard format; a motion picture expert group (MPEG) I or II decompressor, such as the L6402 decompressor manufactured by LSI Logic, to decompress information compressed using the MPEG I or II standard format; a DigiCipher decompressor, such as a DigiCipher decompressor manufactured by Motorola, to decompress information compressed using the DigiCipher standard format; a Dolby AC3 decompressor, such as a Dolby AC3 decompressor manufactured by Zoran, to decompress information compressed using the Dolby AC3 standard format; and/or a Musicam decompressor, such as the L6402 decompressor manufactured by LSI Logic, to decompress information compressed using the Musicam standard format. It may be appreciated that decompression interface 238 may be implemented in hardware or in software. In the case of a software implementation, decompression interface 238 is stored in memory 218 when unused and when used is accessed and run by microprocessor 212 to decompress data. It may further be appreciated that other conventional compression formats may be utilized and corresponding decompressors implemented on decompression interface 238.

Referring to Figure 2C, an alternative embodiment of network chip 202 includes on-chip system memory 240 connecting to processor circuitry 212 through bus 214, thus replacing off-chip memory 218 and memory controller circuitry 220. On-chip system memory 240 may be implemented with a conventional 4M SRAM or DRAM configuration and utilized for storing a software

implementation of decompression interface 238 or a network browser program, such as Netscape.

Referring to Figure 2D, an alternative embodiment of network chip 202 includes a peripheral bus controller interface 242 providing connection to additional processors and/or add-on cards. In alternative or composite embodiments, peripheral bus controller interface 242 includes a standard peripheral component interface (PCI) manufactured by Intel connecting to PCI compatible peripheral devices; an SBUS (Sun workstation bus) interface manufactured by Sun Microsystems connecting to SBUS compatible peripheral devices; an EISA interface connecting to EISA compatible peripheral devices; and/or a Video Electronic Standards Association (VESA) interface connecting to VESA compatible peripheral devices. It may further be appreciated that other peripheral interfaces may be available and/or developed for implementation with compatible peripheral devices and that these other peripheral interfaces may be utilized and implemented on peripheral bus controller interface 242.

Through peripheral bus controller interface 242, shown in Figure 2D, the operating system of browser device 200 maybe upgraded, for instance, to the level of a PC by connection to another printed circuit board or device with a data processor, memory, and software, thereby enabling a user of browser device 200 to run PC applications, such as conventional spreadsheets or word processors. Alternatively or additionally, a printer, such as is conventionally available, could be connected to browser device 200 through peripheral bus controller interface to obtain hard copies of data downloaded from data network 204 and/or from the PC applications.

By integrating digital processor 212, communications interface 210, and display interface 222, network controller chip 202 provides a reduced form factor enabling integration into viewing stations, such as the conventional television set, flat panel display, or computer monitor, telephone, keyboard, mouse, and similar human interface mechanisms or systems. For instance, network controller chip 202 may be integrated into a home electronic system or an entertainment system, such as a stereo, compact disc (CD) or DVD player, video cassette recorder

(VCR), video game, or other home electronic product, or an automobile, airplane, bus, or truck.

Referring to Figures 3A-3D, electronic device 300 installed with network browser chip 202 may be connected to network 302 (Figure 3A), such as the Internet, through communication interface 210 (Figure 2A), and thereby is enabled to communicate bi-directionally with other machines 304 connected to network 302, such as another PC with a modem card and network software, a computer database, or another electronic device installed with network browser chip 300. Network browser chip 202 may be installed on a pre-existing motherboard within a selected electronic device or by insertion of a conventional add-on board.

Referring to Figure 3B, an alternative embodiment of electronic device 300 is shown with network chip 202 including on-chip system boot memory 340. on-chip system boot memory 340 connects to processor circuitry 212 (Figure 2A) through bus 214, thus replacing off-chip memory 218 and memory controller circuitry 220. On-chip system boot memory 340 may be implemented with a conventional 4M SRAM or DRAM configuration and utilized for storing decompression, network browser software, such as NetCruiser or NetScape, or browser operating system software, such as Java manufactured by Sun Microsystems.

Referring to Figure 3C, an alternative embodiment of electronic device 300 is shown with network chip 202 including decompression interface 338. Decompression interface 338 receives data from bus 214 (Figure 2A) containing compressed picture, video, and/or voice information, decompresses the compressed information, and transfers the decompressed picture, video, and/or voice data to display interface circuitry 222 through bus 214. In alternate or composite embodiments, decompression interface 338 includes a joint picture expert group (JPEG) decompressor, such as the L64702 decompressor circuitry manufactured by LSI Logic to decompress information compressed using the JPEG standard format; a motion picture expert group (MPEG) I or II decompressor, such as the L6402 decompressor circuitry manufactured by LSI Logic to decompress information compressed using the MPEG I or II standard format, a DigiCipher decompressor, such as a DigiCipher decompressor manufactured by Motorola to

decompress information compressed using the DigiCipher standard format; a Dolby AC3 decompressor, such as a Dolby AC3 decompressor manufactured by Zoran to decompress information compressed using the Dolby AC3 standard format; and/or a Musicam decompressor, such as the L6402 decompressor manufactured by LSI Logic to decompress information compressed using the Musicam standard format. It may be appreciated that decompression interface 338 may be implemented in hardware or in software. In the case of a software implementation, decompression interface 338 may be stored in memory 218 (or memory 340 shown in Figure 3B) or stored on the network server when unused and when used is accessed and run by microprocessor 212 to decompress data. It may further be appreciated that other conventional compression formats may be utilized and corresponding decompressors implemented on decompression interface 338.

Referring further to Figure 3D, an alternative embodiment of network chip 202 includes a peripheral bus controller interface 342 providing connection to additional processors, graphics devices, sound synthesizers, compression devices and/or further add-on cards. In alternative or composite embodiments, peripheral bus controller interface 342 includes a standard peripheral component interface (PCI) manufactured by Intel connecting to PCI compatible peripheral devices; an SBUS (Sun workstation bus) interface manufactured by Sun Microsystems connecting to SBUS compatible peripheral devices; an EISA interface connecting to EISA compatible peripheral devices; and/or a Video Electronic Standards Association (VESA) interface connecting to VESA compatible peripheral devices. It may further be appreciated that other peripheral interfaces may be available and/or developed for implementation with compatible peripheral devices and that these other peripheral interfaces may be utilized and implemented on peripheral bus controller interface 342.Through peripheral bus controller interface 342, the 25 operating system of electronic device 300 may be upgraded, for instance, to the level of a PC by connection to another printed circuit board or device with a data processor, memory, and software, thereby enabling a user of electronic device 300 to run PC applications, such as conventional spreadsheets or word processors. Alternatively or additionally, a printer, such as is conventionally

available, could be connected to electronic device 300 through peripheral bus controller interface to obtain hard copies of data downloaded from data network 302 and/or from the PC applications.

Electronic device 300 may operate from a conventional power supply, such as a standard wall plug outlet providing standard U.S. alternating current or European direct current voltage supply, and/or, from a conventional rechargeable or non-rechargeable battery supply.

Referring to Figure 4A, an example implementation of electronic device 300 is shown implemented in television system 400. Television 402 includes an electronic interface, such as a conventional television printed circuit board (PCB). Network chip 202 is connected to the PCB,either directly or by introducing an adapter card, and may be accessed through conventional television software through menu 404 shown displayed on television screen 406, such as is conventionally available. Cable source 408 connects to television 402 and provides a communication link between television 402 and data network 302 when accessed by network chip 202. Options may be selected on menu 404 either by control buttons directly on television 402 or through remote control device 410, such as a conventional television or multi-device remote control device utilizing infrared transceivers 412 or similar remote communication equipment. In an alternative embodiment, network chip 202 may be installed on PCB within remote device 410. Alternatively, network chip 202 may be installed on a PCB of VCR 414.

Referring to Figure 4B, an example implementation of electronic device 300 is shown implemented in television 10 system 420. CD player 422 connects to television and includes an electronic interface, such as a conventional television printed circuit board (PCB). Network chip 202 is connected to the PCB, either directly or by introducing an adapter card, and may be accessed through conventional CD software or conventional television software through menu 404 shown displayed on television screen 406. Cable source 408 connects to television 402 and provides a communication link between CD player 422 and data network 302 when accessed by network chip 202. Options may be selected on menu 404 either by control buttons directly on CD player 422 or through

remote control device 424, such as a conventional CD or multi-device remote control device utilizing infrared transceivers 412 or similar remote communication equipment. In an alternative embodiment, network chip 202 may be installed on PCB within remote device 424.

It may further be appreciated that in an alternative embodiment a radio receiver (not shown) could replace CD player 422. In such an embodiment, the radio receiver utilizes either cable source 408 or radio waves to provide a communication link with data network 302.

Referring to Figure 4C, an example implementation of electronic device 300 is shown implemented in telephone system 440. Telephone 442 includes an electronic interface, such as a conventional telephone printed circuit board (PCB). Network chip 202 is connected to the PCB, either directly or by introducing an adapter card, and may be accessed through conventional telephone software through a menu displayed on screen 444 using keypad 446 as a user interface device. Telephone line 448 a communication link between telephone 442 and data network 302 when accessed by network chip 202. Options may be selected on menu 404 either by control buttons directly on telephone 442 or through conventional remote handset 450.

In an alternative embodiment, network chip 202 may be installed on a PCB within remote handset 450. In such an embodiment, remote handset 450 may utilize display 444 or have a resident display on the handset.

In a further embodiment, telephone 442 is replaced by a telephone/ facsimile or a facsimile device. In such case, operation of network chip 202 is initiated in the same manner as with a conventional telephone discussed above.

Referring to Figure 4D, an example implementation of electronic device 300 is shown implemented in cellular telephone system 460. Cellular telephone 462 includes an electronic interface, such as a conventional cellular telephone printed circuit board (PCB). Network chip 202 is connected to the PCB, either directly or by introducing an adapter card, and may be accessed through conventional cellular telephone software through a menu displayed on screen 464 using keypad 466 as a user interface device. Cellular telephone transceiver 468

provides a communication link between cellular telephone 462, telephone server 470 and data network 302 when accessed by network chip 202.

In an alternative embodiment, network chip 202 may be installed on a PCB within a beeper (not shown) including a display and keypad, rather than a cellular telephone. The beeper includes either a radio transceiver or cellular circuitry which may be used to establish a connection to data network 302.

Referring to Figure 5, flowchart 500 is shown describing a user network session utilizing electronic device 300. The user initiates a network session by causing the electronic device to initialize the browser system software 502, as by powering up electronic device 300. The initialization sequence causes digital processor 212 to access the browser system software from memory, for instance memory 218 (Figure 2A) or 240 (Figure 2C).

The browser system software causes the electronic device 300 to prompt a user to instruct the electronic device 300 on the type of display/audio and user equipment attached to electronic device 300. The user selects the display/audio and user equipment 504 from a menu including a listing of compatible monitors, PCs, televisions, speakers, mice or other pointing devices, keyboards, or remote devices, such as a television, VCR, or CD infrared remote control unit; or, the user types the name of the display/audio and user equipment. Alternatively, the user may be prompted to specify the display/audio and user equipment protocol; or, the type of display/audio and user equipment and corresponding protocol may be pre-specified within the browser system software.

Upon receiving the display/audio and user equipment information, digital processor 212 instructs display/audio interface 222 and serial port interface 232 on the type of display/audio and user equipment protocol to utilize in order to interpret communication between the user and electronic device 300.

Next, the browser system software causes the electronic device 300 to prompt a user to instruct the electronic device 300 on the type of network communication equipment attached to electronic device 300. The user selects the network communication equipment 506 from a menu including a listing of compatible telephone modems, cable modems, satellite, ISDN, ATM, or Ethernet; or, the user types the name of the communication equipment. Alternatively, the

user may be prompted to specify the communication equipment protocol; or, the type of communication equipment and corresponding protocol may be pre-specified within the browser system software.

Upon receiving the communication equipment information, digital processor 212 instructs communication interface 222 on the type of communication equipment protocol to utilize in order to interpret communication between electronic device 300 and data network 302. Depending upon the communication equipment utilized, the user may again be prompted to make further selections defining the protocol. For instance, the user may communicate by modem transmissions over a network, such as the Internet, using various modes of operation in the same manner as conventional PCs. Using WinFax PRO® in conjunction with the present invention, a user initially sets up a modem initialize string in the software by choosing from a set of operating modes, which includes conventional asynchronous or compatible modes.

Next, the browser system software initializes network software 508 by causing digital processor 212 to access a memory storing the network software, such as memory 216, 218, or 240, and to operate the network software. Alternatively, electronic device 300 may prompt the user to select the type of network software to be initialized, whereupon the user may simply select the network software, such as Netcom or Netscape, for operation on the network electronic device 300.

After initialization of the network software, the user is prompted by electronic device 300 to log onto the network 510 by inputting the user name and password. Upon receiving the user identification information, digital processor 212 then causes communication interface 210 to request a link with data network 302. If a valid user name and password has been utilized, then a communication link is established between the user and data network 302 through electronic device 300.

Thereafter, the user selects an option 512, e.g. from a menu including mail, news group, World-Wide-Web (WWW), Gopher, Telnet (remote computer log-on), FTP (file transfers), Finger (listing network users), and IRC(conversation link). The network software then prompts the user to select a sub-topic 514, e.g.

read or send mail, download articles from or upload articles to a news group, connect to a database using WWW browser software, search for information utilizing Gopher browser software, connect to a remote computer utilizing Telnet software, transfer software files using FTP software, or converse with Internet users using IRC software. Upon making a selection, a request is sent through the user devices, such as keyboard 234 and mouse 236, to communication interface 210. Communication interface 210 translates and sends the request onto data network 204, interprets any received data and sends the interpreted network data to display/audio interface 222. Display/audio interface 222 translates the interpreted response and delivers the translated data onto the applicable display/audio device, such as display unit 224 or speaker 226. Each of the above-related steps within electronic device 300 occur seamlessly for the user as in the same manner with conventional networked PC transmissions.

Upon display on display unit 224, the user may read the selected network transmission, or if the transmission is audio data, then the user may listen to the selected network transmission over speaker 226. Thereafter, the user may choose another selection 516 or end the network session 518.

In short, electronic device 300 appears to respond just as conventional PCs utilizing conventional modems. The present invention provides an intelligent system that converts data into and from network protocols on each end of a network transmission of digital data.

It should be further appreciated that various components described above, such as communication interface, display interface, memory controller, serial port interface 232, decompression, and peripheral component interface, have been referred to as circuitry; however, each of the respective components may be synthesized with a combination of circuitry and software, or entirely with software, and are generally a combination of circuitry and software.

CLAIMS

What is claimed is:

1. An integrated network browser controller chip, comprising:

a digital processor for controlling browser operation;

a communication interface for connection with a network;

a user interface; and

a bus interconnecting the digital processor, communication interface, and user interface.

2. The network browser chip according to Claim 1, comprising a memory controller coupled to the bus.

3. The network browser chip according to Claim 2, comprising a memory controlled by the memory controller.

4. The network browser chip according to Claim 1, comprising a cache memory coupled to the digital processor.

5. The network browser chip according to Claim 1,comprising a system memory.

6. An integrated network browser controller chip for transmission and reception of data, including:

a digital processor for controlling browser operation;

a communication interface for connecting the network browser chip to a network; and

a user interface providing a communication channel between the user and the network browser chip.

7. The network browser chip according to Claim 6, wherein the communication interface translates data and instructions transferred between the network and the network browser chip.

8. The network browser chip according to Claim 6, wherein the user interface translates data and instructions transferred between the user and the network browser chip.

9. The network browser chip according to Claim 6,comprising an internal system bus connecting the digital processor, communication interface, and user interface, and providing a conduit for transferring data and instructions.

10. The network browser chip according to Claim 6, comprising a cache memory connecting to the digital processor and storing instructions and data for operation by the digital processor.

11. A method for accessing a data network using an integrated network controller chip, comprising the steps of:

receiving an instruction for executing a network operation, the instruction indicating a network server address; executing the network operation by sending a request to the network server address; and

receiving a response from the network server address.

12. The method of Claim 11, the step of receiving a response further comprising the steps of:

decoding the response from the network server address to indicate additional optional steps;

receiving a second instruction for executing a second network operation, the second instruction indicating a selection of one of the optional steps;

executing the second network operation by sending a second request to the network server address; and

receiving a second response from the network server address providing information responsive to the selection.

13. An integrated network browser device, including:

a single integrated network controller chip for controlling communication with a network;

a communication interface connecting the network controller with the network; and

a user interface connecting to the network controller chip and providing access to a user for transferring data and instructions between the user, the browser device, and the network.

14. The network browser device according to Claim 13, wherein the network controller chip accesses and operates software from a network server for transferring data and instructions between the user and the network.

15. The network browser device according to Claim 13, comprising

a system memory connected to the controller chip for storing system software operable by the network controller chip.

16. The network browser device according to Claim 15, wherein the system memory comprises an on-chip memory.

17. The network browser device according to Claim 13 wherein the network controller chip comprises:

a digital processor for controlling browser operation.

18. The network browser device according to Claim 13 wherein the communication interface is incorporated within the network controller chip.

19. The network browser device according to Claim 13 wherein the user interface is incorporated within the network controller chip.

20. An integrated network browser device for transmission and reception of data, including:

a single integrated network controller chip for controlling communication with a network;

a system memory connected to the controller chip for storing system software operable by the said network controller chip;

a communication port connecting the network controller chip with the network medium for transferring data and instructions between the browser device and the network; and

a user interface port connecting to the network controller chip and providing access to a user for transferring data and instructions between the user, the browser device, and the network;

the network controller chip including:

an internal system bus connecting the communication port to the user interface port for channeling data and instructions through the network controller chip;

a communication interface connecting the communication port to the internal system bus for translating data and instructions transferring between the network and network controller chip;

a digital processor connecting to the internal system bus for controlling operation of the network browser device;

a cache memory connecting to the digital processor and storing instructions and data for operation by the digital processor; and

a user interface connecting the user interface port to the internal system bus for translating instructions and data between the user and the network browser device.

21. An electronic human interface device, including:

an electronic device for performing a non-networking task, the electronic device including an electronic interface; and,

a single integrated network controller chip connecting to the electronic interface for controlling communication with a network;

the network controller chip including:

a digital processor for controlling browser operation;

a communication interface for connecting the network browser chip to a network and for translating data and instructions transferred between the network and network browser chip;

a user interface for translating instructions and data between the user and the network browser chip;

and an internal system bus connecting the digital processor,communication interface, and user interface, and, providing a conduit for transferring data and instructions through the network browser chip.

22. The electronic human interface device according to Claim 21, wherein the electronic device for performing anon-networking task comprises a video cassette recorder.

23. A network system for communication of data over a network through a single chip integrated network browser device, including:

a network;

at least two devices connected to the network;

and one of the said devices comprising a network browser device having a single integrated network controller chip;

the network controller chip including:

an internal system bus connecting the communication port to the user interface port for channeling data and instructions through the network controller chip;

a communication interface connecting the communication port to the internal system bus for translating data and instructions transferring between the network and network controller chip;

a digital processor connecting to the internal system bus for controlling operation of the network browser device;

a cache memory connecting to the digital processor and storing instructions and data for operation by the digital processor; and

a user interface connecting the user interface port to the internal system bus for translating instructions and data between the user and the network browser device.

24. A network system for communication of data over a network, including:

a network;

at least two devices connected to the network; and

one of the said devices comprising an electronic human interface device, the electronic human interface device including:

an electronic device for performing a non-networking task, the electronic device including an electronic interface; and,

a single integrated network controller chip connecting to the electronic interface for controlling communication with the network;

the network controller chip including:

a digital processor for controlling browser operation;

a communication interface for connecting the network browser chip to a network and for translating data and instructions transferred between the network and network browser chip;

a user interface for translating instructions and data between the user and the network browser chip; and an internal system bus connecting the digital processor, communication interface, and user interface, and, providing a conduit for transferring data and instructions through the network browser chip.

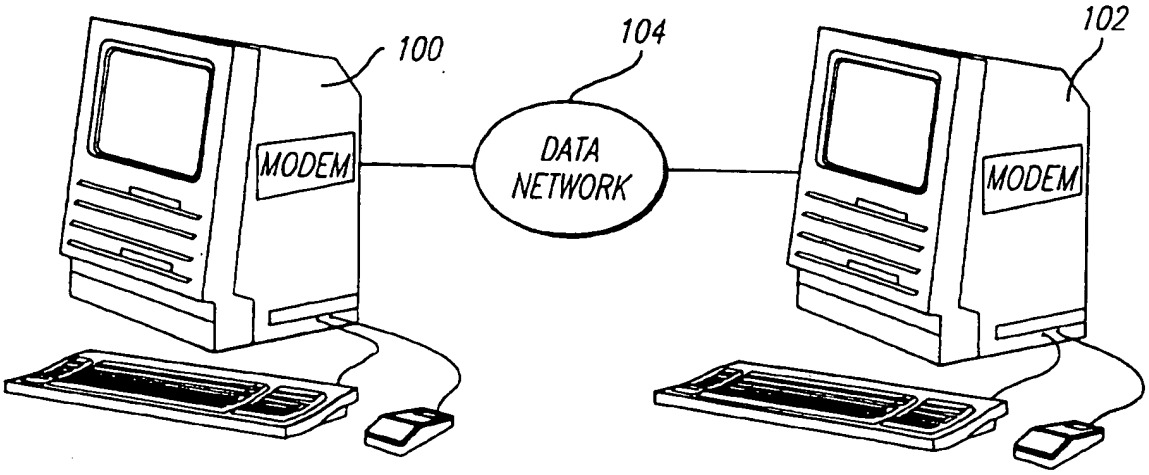


FIG. 1
PRIOR ART

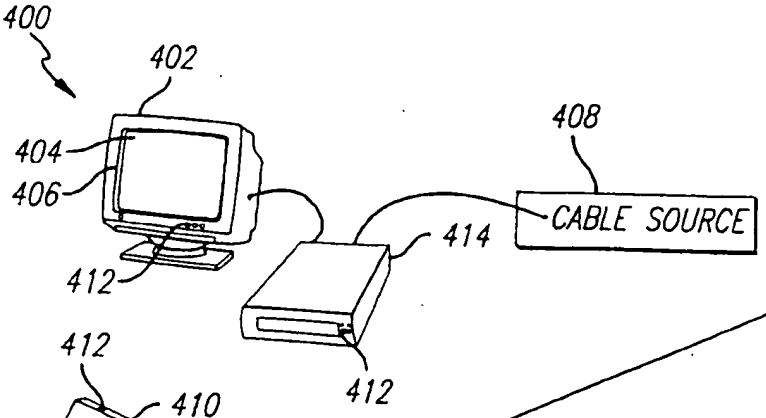


FIG. 4A

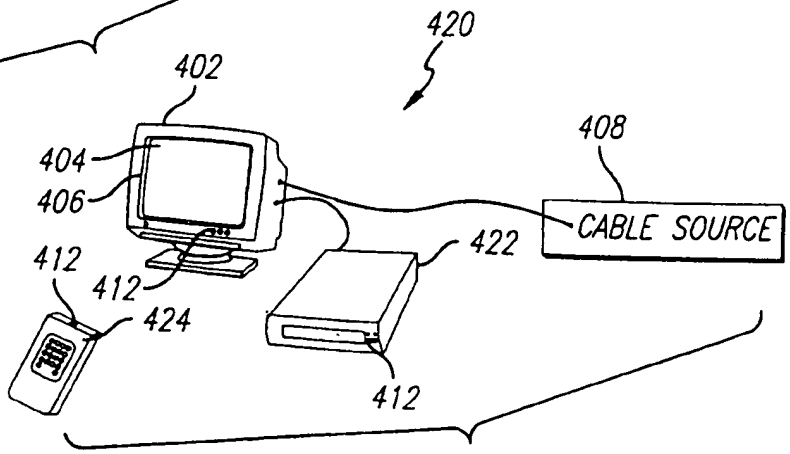
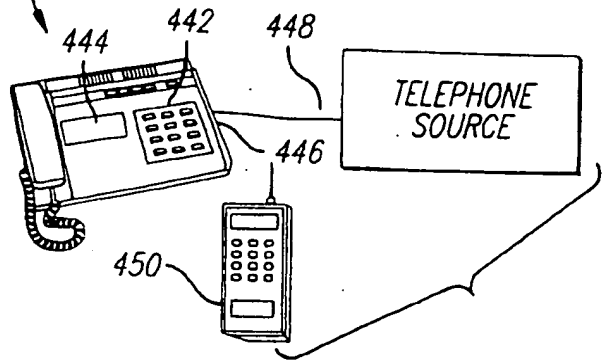


FIG. 4B

FIG. 4C



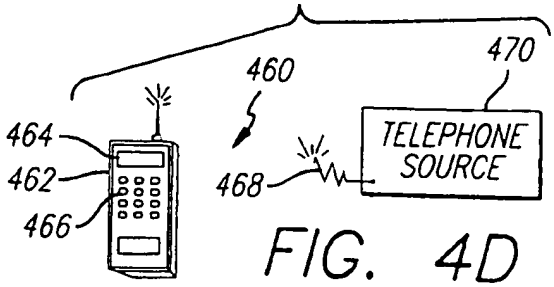


FIG. 4D

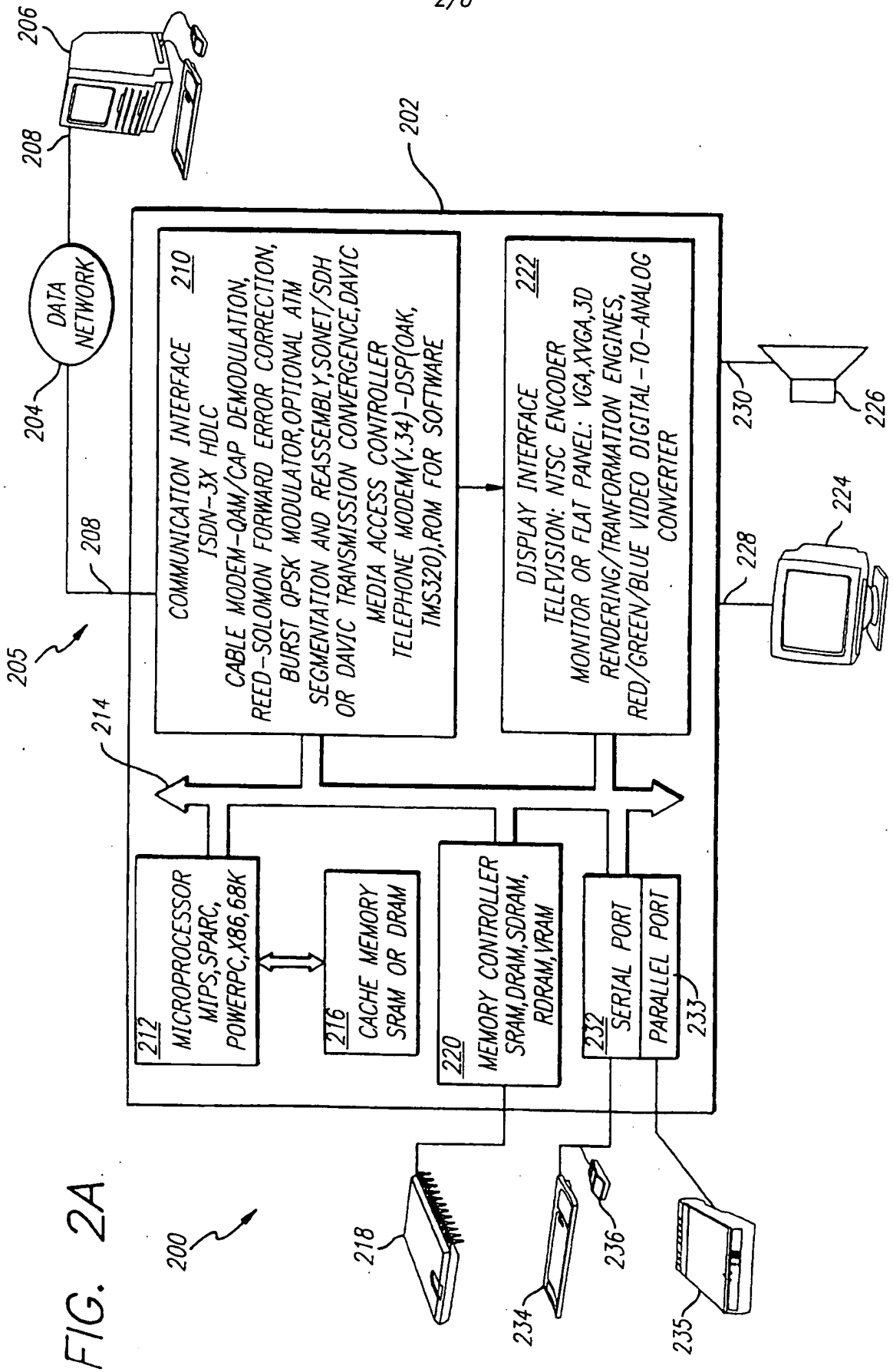

206
208
202
DATA NETWORK
204
208
210
COMMUNICATION INTERFACE
ISDN-3X HDLC
CABLE MODEM-QAM/CAP DEMODULATION,
REED-SOLOMON FORWARD ERROR CORRECTION,
BURST QPSK MODULATOR,OPTIONAL ATM
SEGMENTATION AND REASSEMBLY,SONET/SDH
OR DAVIC TRANSMISSION CONVERGENCE,DAVIC
MEDIA ACCESS CONTROLLER
TELEPHONE MODEM(V.34)-DSP(OAK,
TMS320),ROM FOR SOFTWARE
222
DISPLAY INTERFACE
TELEVISION: NTSC ENCODER
MONITOR OR FLAT PANEL: VGA,XVGA,3D
RENDERING/TRANFORMATION ENGINES,
RED/GREEN/BLUE VIDEO DIGITAL-TO-ANALOG
CONVERTER
230
226
224
228
205
214
212
MICROPROCESSOR
MIPS,SPARC,
POWERPC,X86,68K
216
CACHE MEMORY
SRAM OR DRAM
220
MEMORY CONTROLLER
SRAM,DRAM,SDRAM,
RDRAM,VRAM
232
SERIAL PORT
PARALLEL PORT
233
200
218
234
236
235

FIG. 2A

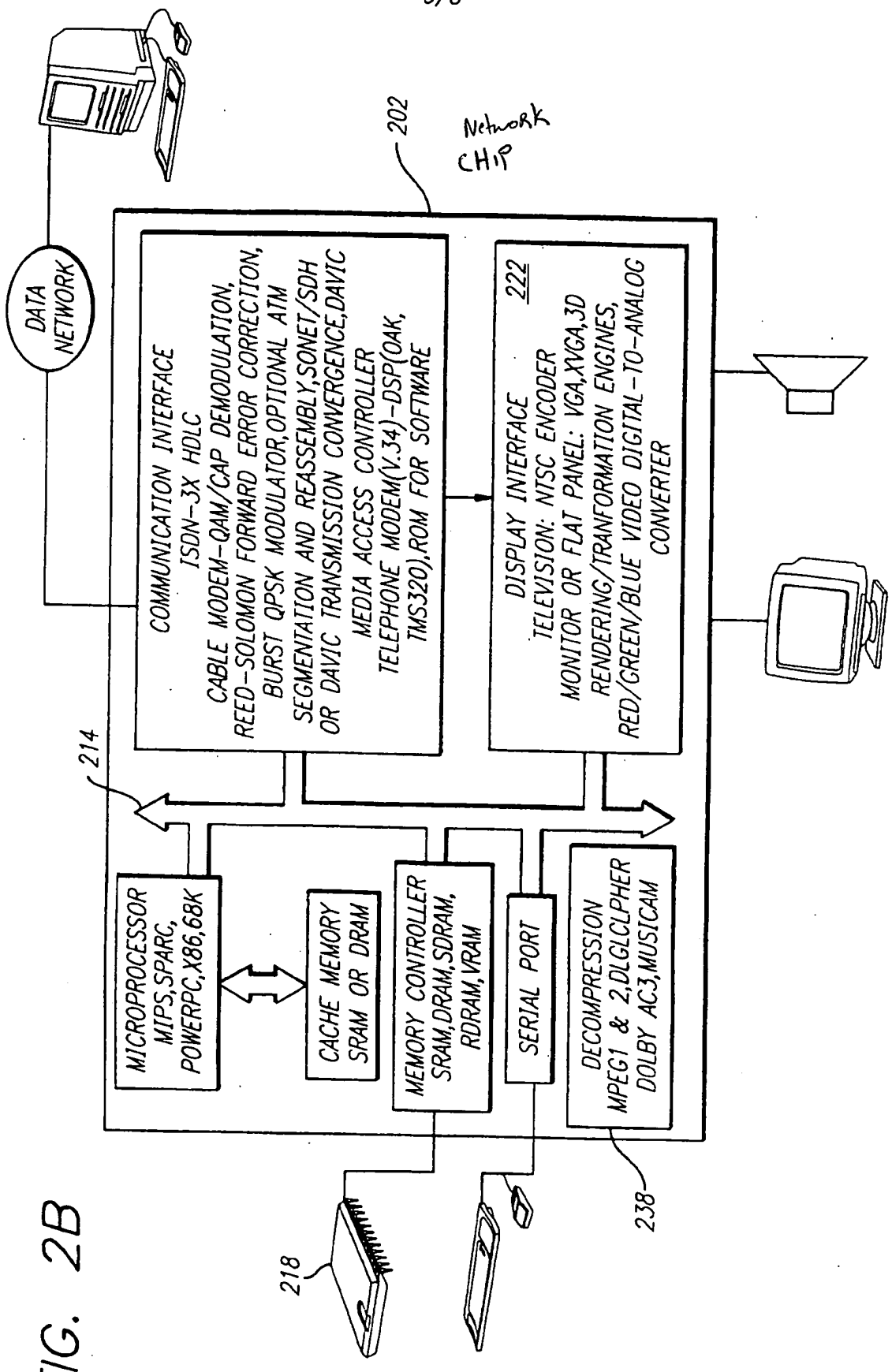

202
Network CHIP
DATA NETWORK
COMMUNICATION INTERFACE
ISDN-3X HDLC
CABLE MODEM-QAM/CAP DEMODULATION,
REED-SOLOMON FORWARD ERROR CORRECTION,
BURST QPSK MODULATOR, OPTIONAL ATM
SEGMENTATION AND REASSEMBLY, SONET/SDH
OR DAVIC TRANSMISSION CONVERGENCE, DAVIC
MEDIA ACCESS CONTROLLER
TELEPHONE MODEM(V.34)-DSP(OAK,
TMS320), ROM FOR SOFTWARE
DISPLAY INTERFACE 222
TELEVISION: NTSC ENCODER
MONITOR OR FLAT PANEL: VGA, XVGA, 3D
RENDERING/TRANFORMATION ENGINES,
RED/GREEN/BLUE VIDEO DIGITAL-TO-ANALOG
CONVERTER
214
MICROPROCESSOR
MIPS, SPARC,
POWERPC, X86, 68K
CACHE MEMORY
SRAM OR DRAM
MEMORY CONTROLLER
SRAM, DRAM, SDRAM,
RDRAM, VRAM
SERIAL PORT
DECOMPRESSION
MPEG1 & 2, DLGLCLPHER
DOLBY AC3, MUSICAM
238
218

FIG. 2B

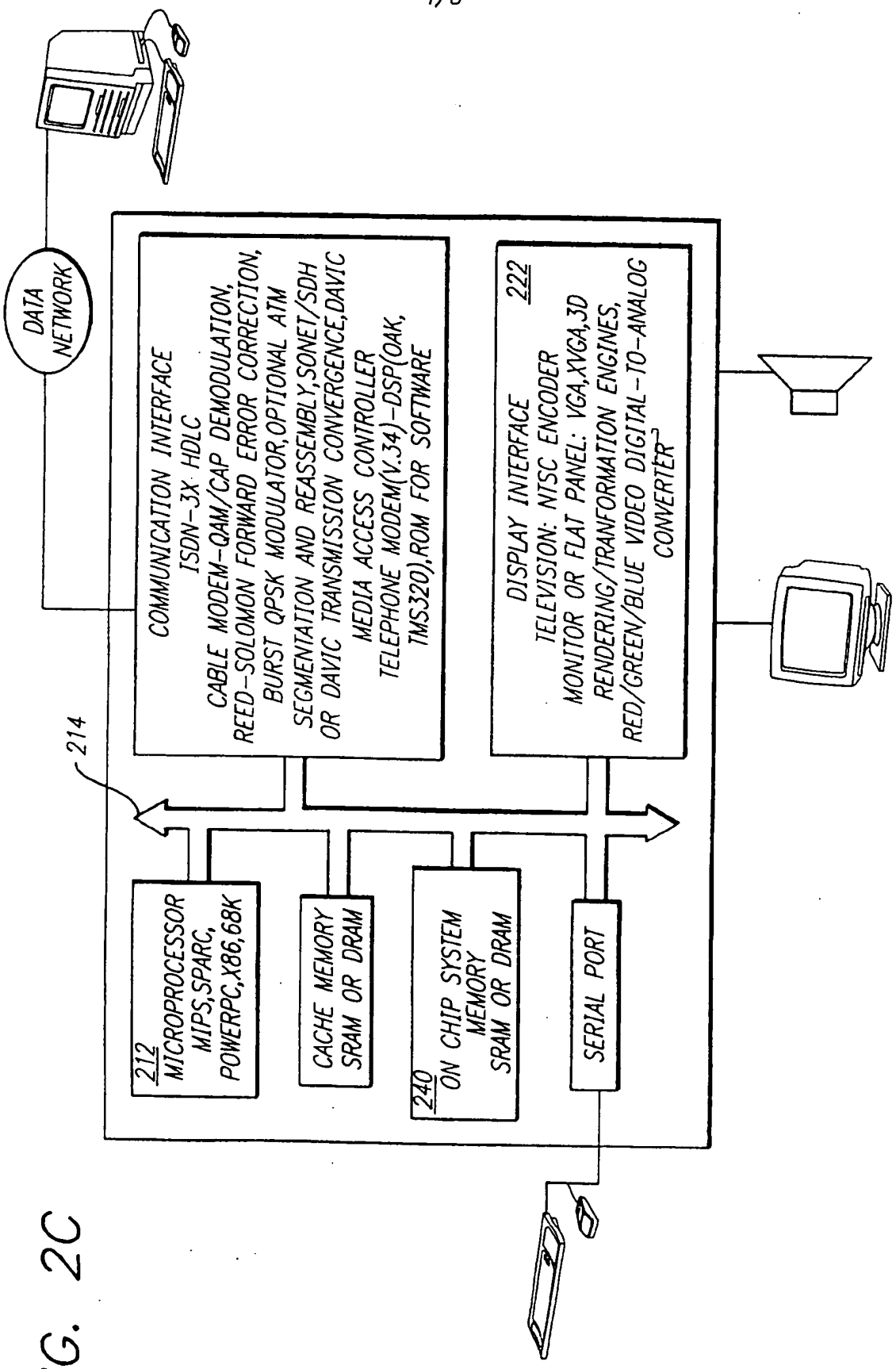

DATA NETWORK
COMMUNICATION INTERFACE
ISDN-3X HDLC
CABLE MODEM-QAM/CAP DEMODULATION,
REED-SOLOMON FORWARD ERROR CORRECTION,
BURST QPSK MODULATOR,OPTIONAL ATM
SEGMENTATION AND REASSEMBLY,SONET/SDH
OR DAVIC TRANSMISSION CONVERGENCE,DAVIC
MEDIA ACCESS CONTROLLER
TELEPHONE MODEM(V.34)-DSP(OAK,
TMS320),ROM FOR SOFTWARE
DISPLAY INTERFACE 222
TELEVISION: NTSC ENCODER
MONITOR OR FLAT PANEL: VGA,XVGA,3D
RENDERING/TRANFORMATION ENGINES,
RED/GREEN/BLUE VIDEO DIGITAL-TO-ANALOG
CONVERTER
214
212 MICROPROCESSOR
MIPS,SPARC,
POWERPC,X86,68K
CACHE MEMORY
SRAM OR DRAM
240 ON CHIP SYSTEM
MEMORY
SRAM OR DRAM
SERIAL PORT

FIG. 2C

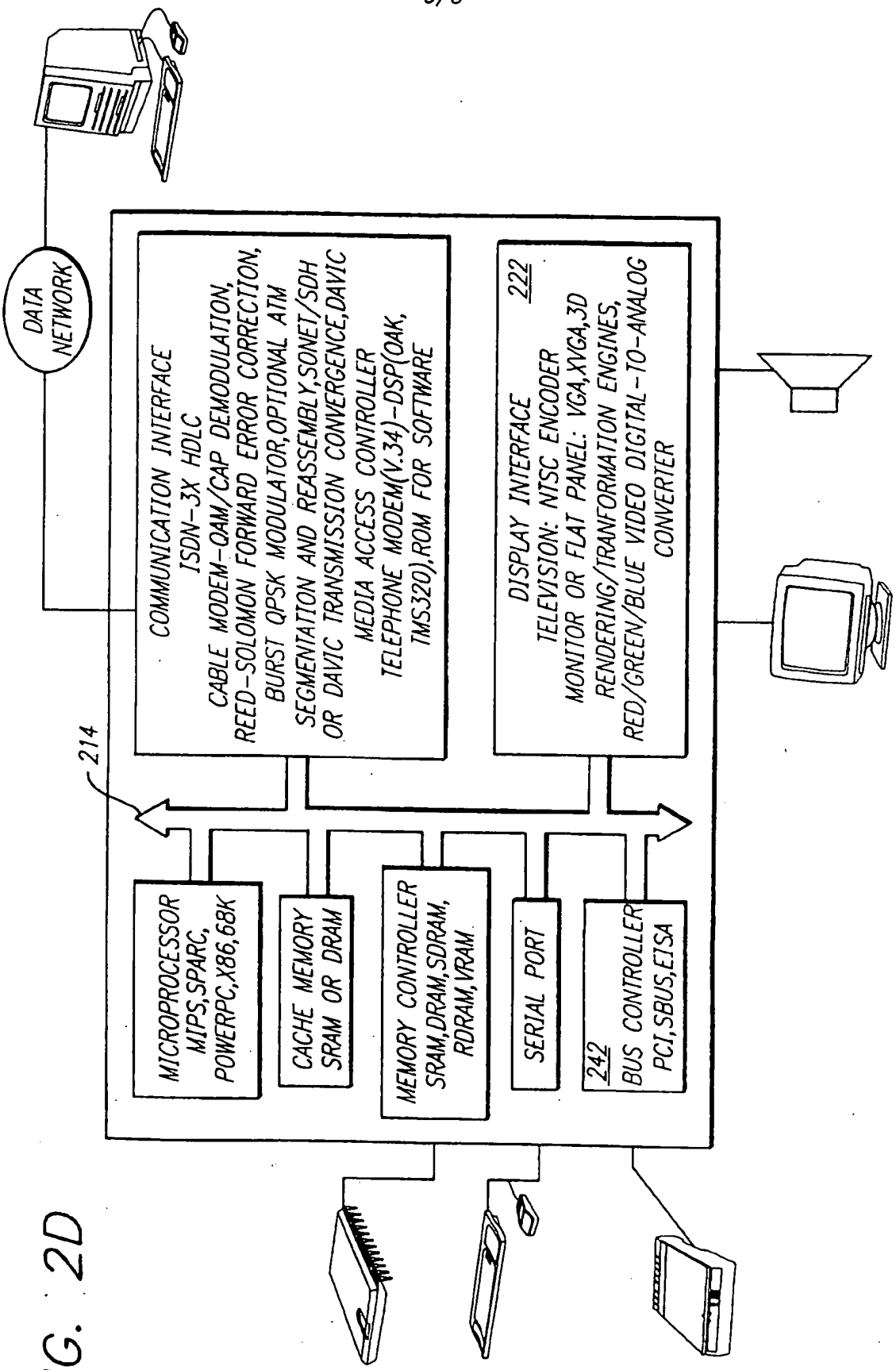

DATA NETWORK
COMMUNICATION INTERFACE
ISDN-3X HDLC
CABLE MODEM-QAM/CAP DEMODULATION,
REED-SOLOMON FORWARD ERROR CORRECTION,
BURST QPSK MODULATOR,OPTIONAL ATM
SEGMENTATION AND REASSEMBLY,SONET/SDH
OR DAVIC TRANSMISSION CONVERGENCE,DAVIC
MEDIA ACCESS CONTROLLER
TELEPHONE MODEM(V.34)-DSP(OAK,
TMS320),ROM FOR SOFTWARE
DISPLAY INTERFACE 222
TELEVISION: NTSC ENCODER
MONITOR OR FLAT PANEL: VGA,XVGA,3D
RENDERING/TRANFORMATION ENGINES,
RED/GREEN/BLUE VIDEO DIGITAL-TO-ANALOG
CONVERTER
214
MICROPROCESSOR
MIPS,SPARC,
POWERPC,X86,68K
CACHE MEMORY
SRAM OR DRAM
MEMORY CONTROLLER
SRAM,DRAM,SDRAM,
RDRAM,VRAM
SERIAL PORT
242
BUS CONTROLLER
PCI,SBUS,EISA

FIG. 2D

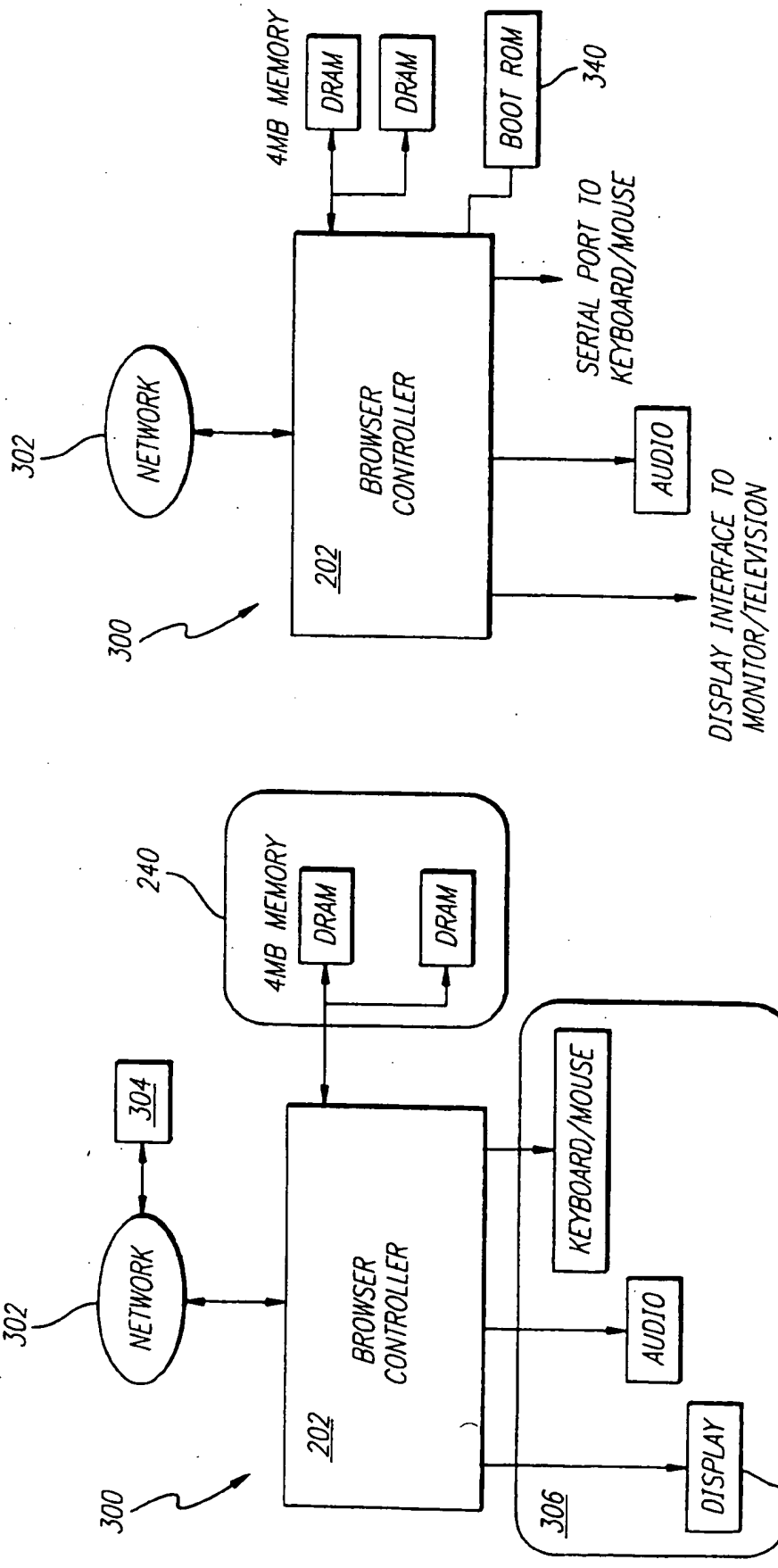

4MB MEMORY
DRAM
DRAM
BOOT ROM
340
SERIAL PORT TO KEYBOARD/MOUSE
302
NETWORK
BROWSER CONTROLLER
202
AUDIO
DISPLAY INTERFACE TO MONITOR/TELEVISION
300
240
4MB MEMORY
DRAM
DRAM
304
NETWORK
302
BROWSER CONTROLLER
202
KEYBOARD/MOUSE
AUDIO
DISPLAY
308
306
300

FIG. 3B

FIG. 3A

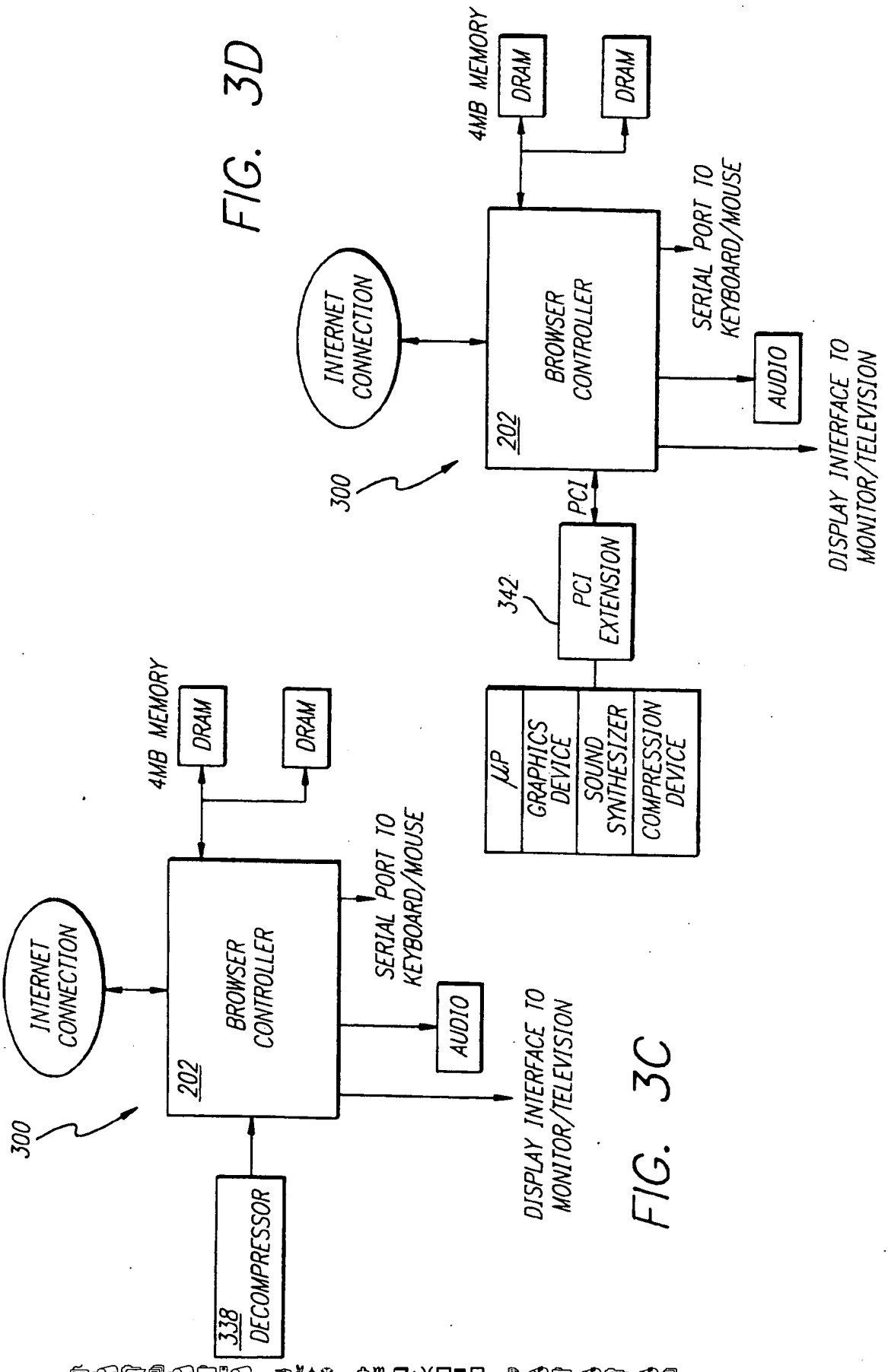

300
INTERNET CONNECTION
202
BROWSER CONTROLLER
338
DECOMPRESSOR
4MB MEMORY
DRAM
DRAM
SERIAL PORT TO KEYBOARD/MOUSE
AUDIO
DISPLAY INTERFACE TO MONITOR/TELEVISION
μP
GRAPHICS DEVICE
SOUND SYNTHESIZER
COMPRESSION DEVICE
342
PCI EXTENSION
PCI

FIG. 3C

FIG. 3D

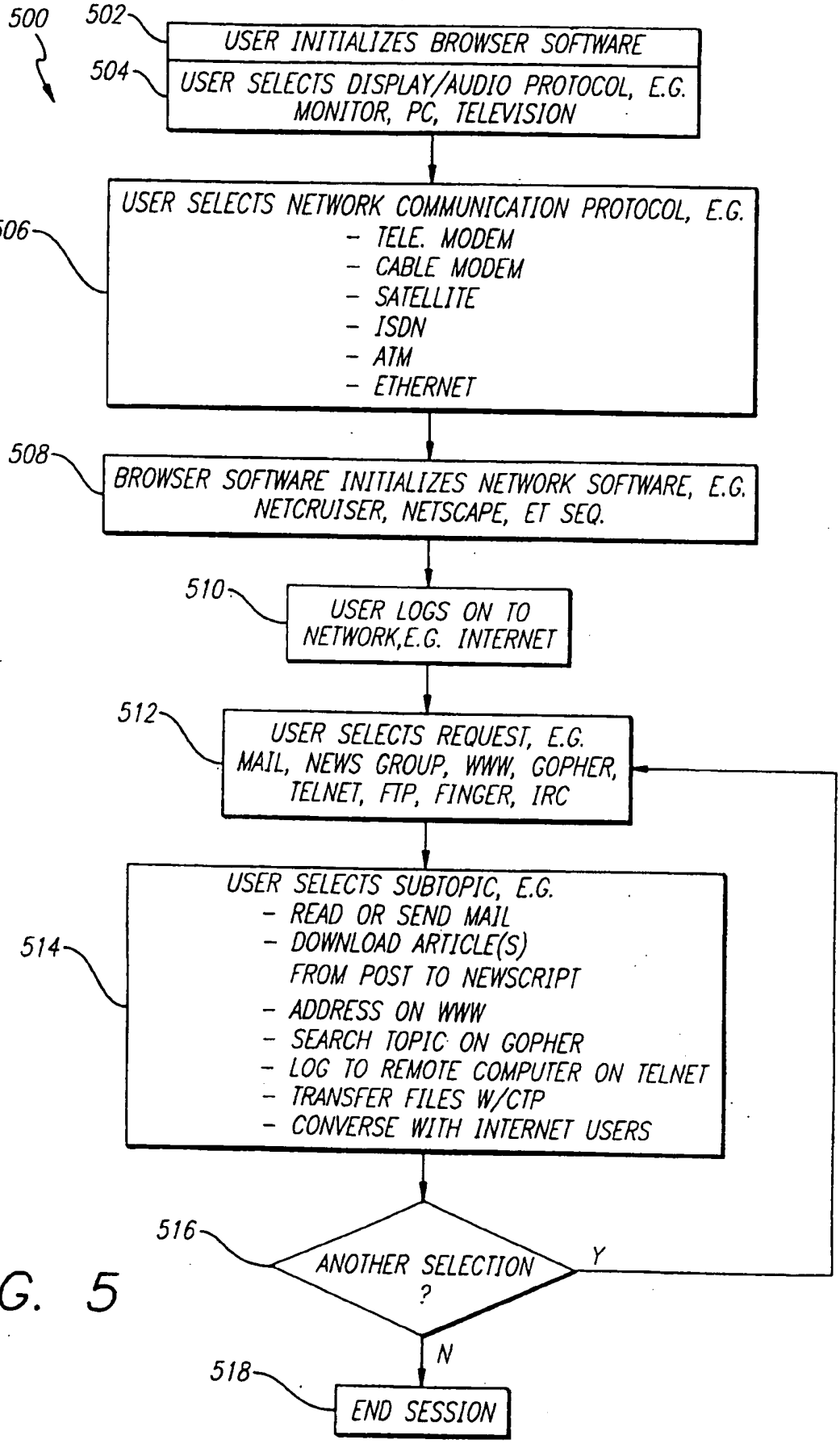

500
502
USER INITIALIZES BROWSER SOFTWARE
504
USER SELECTS DISPLAY/AUDIO PROTOCOL, E.G. MONITOR, PC, TELEVISION
506
USER SELECTS NETWORK COMMUNICATION PROTOCOL, E.G.
- TELE. MODEM
- CABLE MODEM
- SATELLITE
- ISDN
- ATM
- ETHERNET
508
BROWSER SOFTWARE INITIALIZES NETWORK SOFTWARE, E.G. NETCRUISER, NETSCAPE, ET SEQ.
510
USER LOGS ON TO NETWORK,E.G. INTERNET
512
USER SELECTS REQUEST, E.G. MAIL, NEWS GROUP, WWW, GOPHER, TELNET, FTP, FINGER, IRC
514
USER SELECTS SUBTOPIC, E.G.
- READ OR SEND MAIL
- DOWNLOAD ARTICLE(S) FROM POST TO NEWSCRIPT
- ADDRESS ON WWW
- SEARCH TOPIC ON GOPHER
- LOG TO REMOTE COMPUTER ON TELNET
- TRANSFER FILES W/CTP
- CONVERSE WITH INTERNET USERS
516
ANOTHER SELECTION ?
Y
N
518
END SESSION

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/19125

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06G 3/10

[illegible]

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/200.01, 200.02, 200.,09, 800

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS Text search, Internet, browers, ASIC, processor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US, 5,572,643 A (JUDSON) 5 November 1996 (5-11-1996), entire document, especially Figure 2.	1-24
Y, P	US, 5,495,422 A (OLSON) 24 February 1996 (27-2-1996), entire document, especially Figure 8 and columns 15-16.	1-24
Y,P	US, 5,546,547 A (BOWES, ET AL.) 13 August 1996 (13-8-1996), Figures 2 and 4.	1-24

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 12 FEBRUARY 1997	Date of mailing of the international search report 01 APR 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer RICHARD J. GREGSON Telephone No. (703) 305-9700

Form PCT/ISA/210 (second sheet)(July 1992)*